Solar Heliospheric & INterplanetary Environment (SHINE) Conference
24-28 July, 2017, Saint-Sauveur, Quebec, Canada
http://shinecon.org/CurrentMeeting.php
(poster presentation)

Realistic 3D radiative modeling of turbulent structure of moderate-mass stars and Sun

I. N. Kitiashvili, Alexander G. Kosovichev (NJIT), Alan A. Wray (NASA Ames Research Center), Nagi N. Mansour (NASA Ames Research Center)

Understanding the turbulent dynamics of the Sun and stars is a critical element for interpreting observed processes and phenomena on different scales and for predicting extreme events such as flares and superflares. High-resolution observations of the Sun and high-fidelity radiative MHD numerical simulations have substantially advanced our understanding of solar and stellar local dynamics and magnetism from the upper convection zone to the atmosphere and corona. However, global modeling of the Sun with such a high degree of realism is currently not affordable due to the extremely high computational cost of resolving the scales in the convection zone. The physics of the deep solar dynamics can be effectively addressed through modeling more massive solar-type stars where the convection zone is shallower and the convective overturning time is much shorter than those on the Sun. We present recent 3D realistic simulation results of moderate-mass stars and discuss links between solar and stellar dynamics, such as the multiscale structure of granulation, convective overshoot, and others. In particular, these simulations have provided better understanding of the dynamics of the tachocline (the overshoot layer at the bottom of the convection zone) and have explained long-standing results from helioseismology.